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(54) **SPIN COATING BOWL EXHAUST SYSTEM**

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(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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(22) Filed: **Jun. 22, 1998**

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(63) Continuation of application No. 08/667,740, filed on Jun. 21, 1996, now Pat. No. 5,769,945.

(51) **Int. Cl.**[7] **B05C 11/02**

(52) **U.S. Cl.** **118/52**; 118/56; 118/319; 118/320; 118/500; 134/137; 134/154; 134/182; 210/285; 261/108

(58) **Field of Search** 118/52, 56, 319, 118/320, 500; 134/137, 154, 182; 210/285; 141/286; 222/547, 564; 261/108

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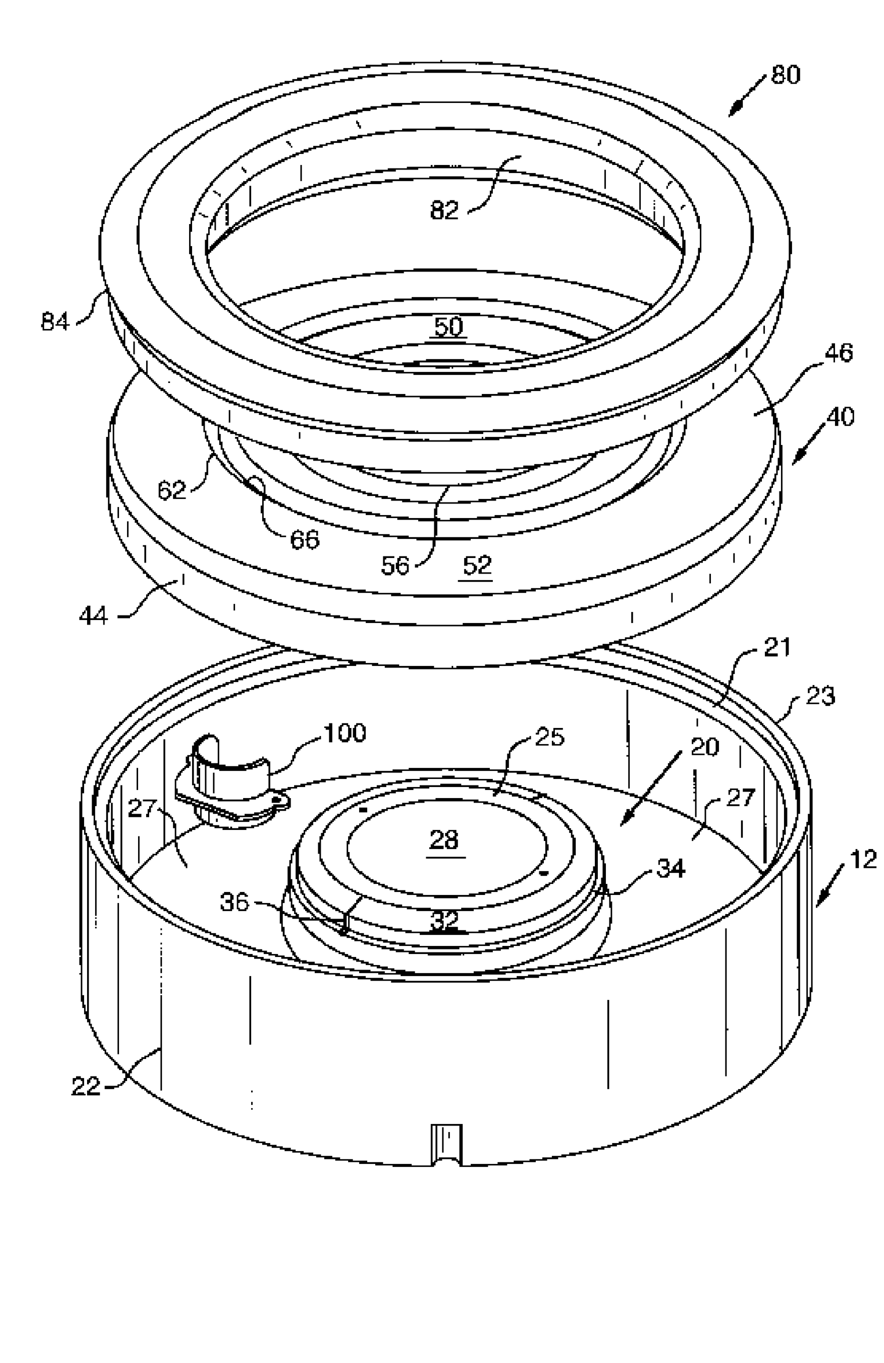
(57) **ABSTRACT**

An apparatus for exhausting coating materials used in the process of spin coating a top surface of a wafer, the wafer having an edge and a bottom surface that is supported and rotated by a rotatable chuck attached by a shaft to a spin motor. The apparatus includes a bowl having an exhausted drain configured to receive excess liquid and vapor from the spin coating and an assembly configured to maintain the drain at a negative pressure differential relative to the bowl. In a preferred embodiment, a baffle is attached to the bottom to limit the flow of the liquid and vapor into the drain to a predetermined direction.

10 Claims, 8 Drawing Sheets



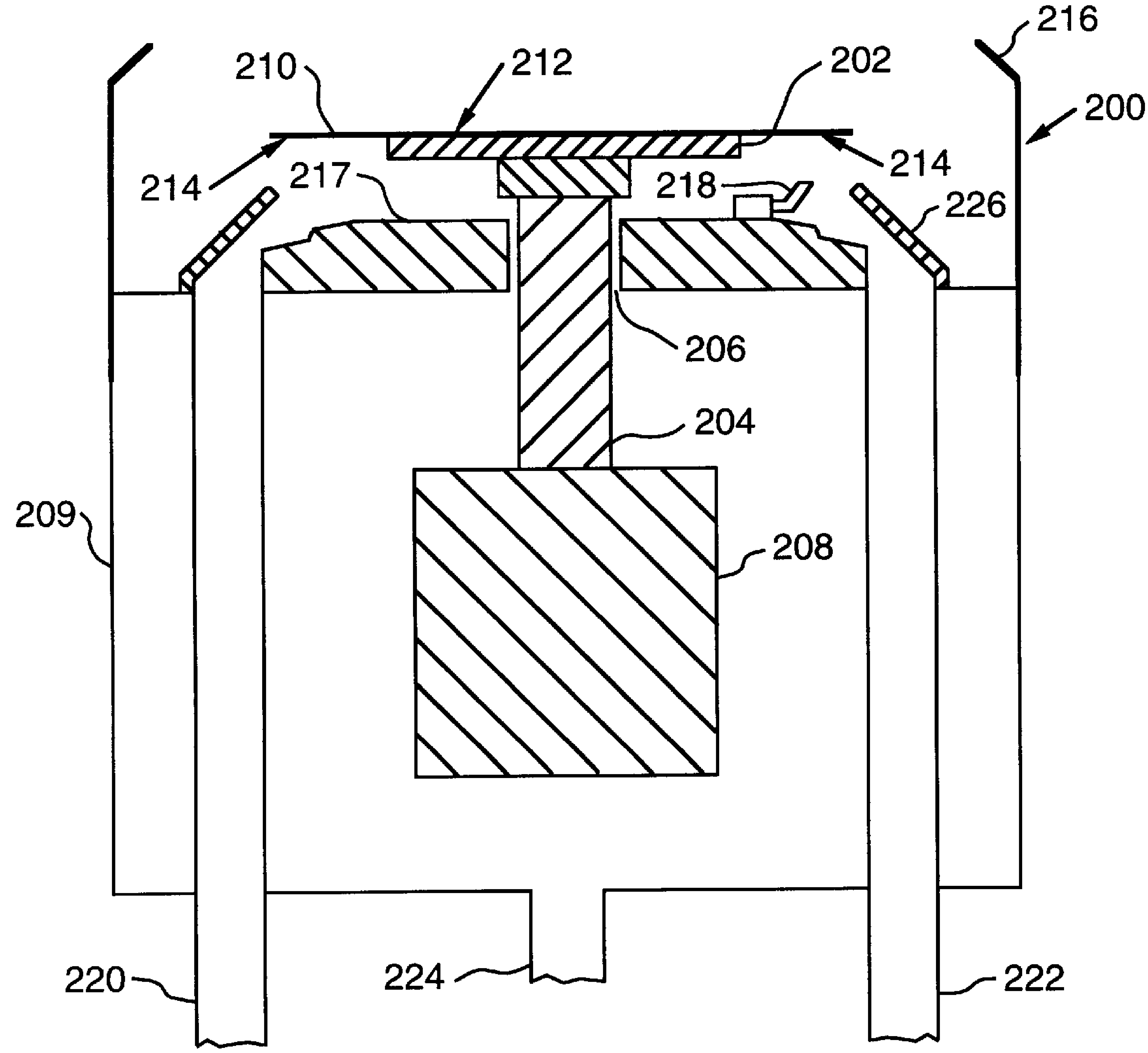


FIG. 1 Prior Art

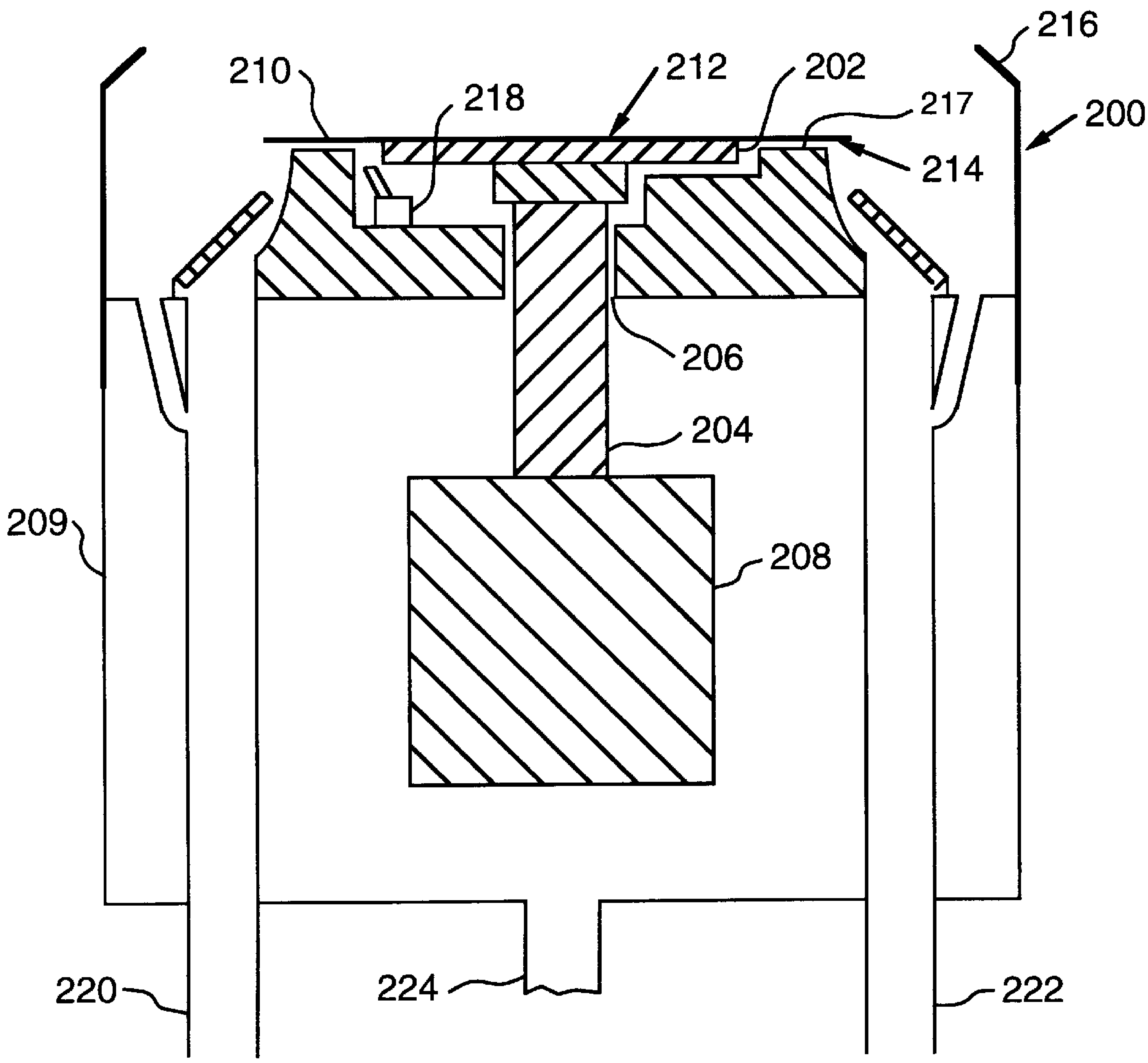


FIG. 2 Prior Art

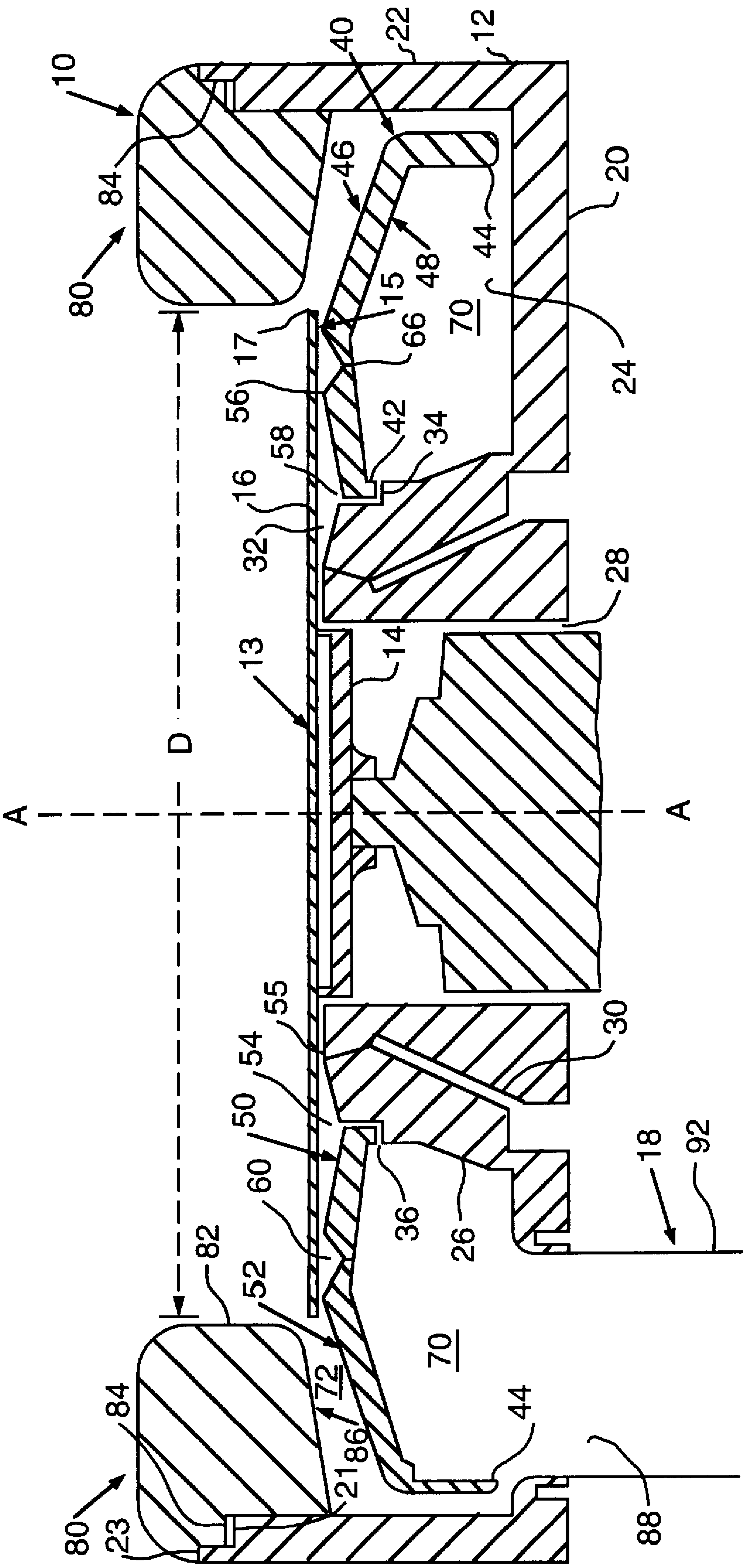

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FIG. 3

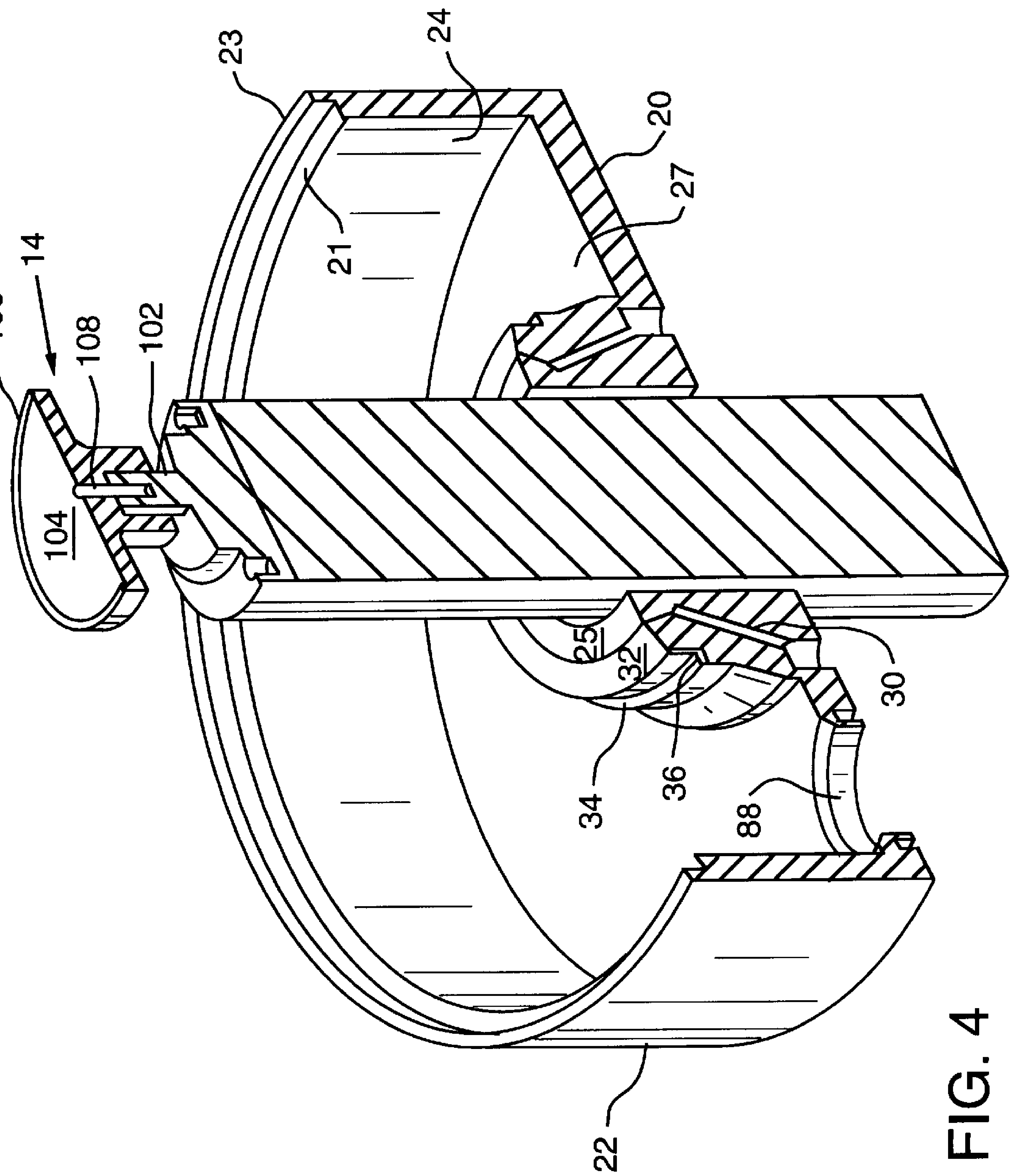

FIG. 4

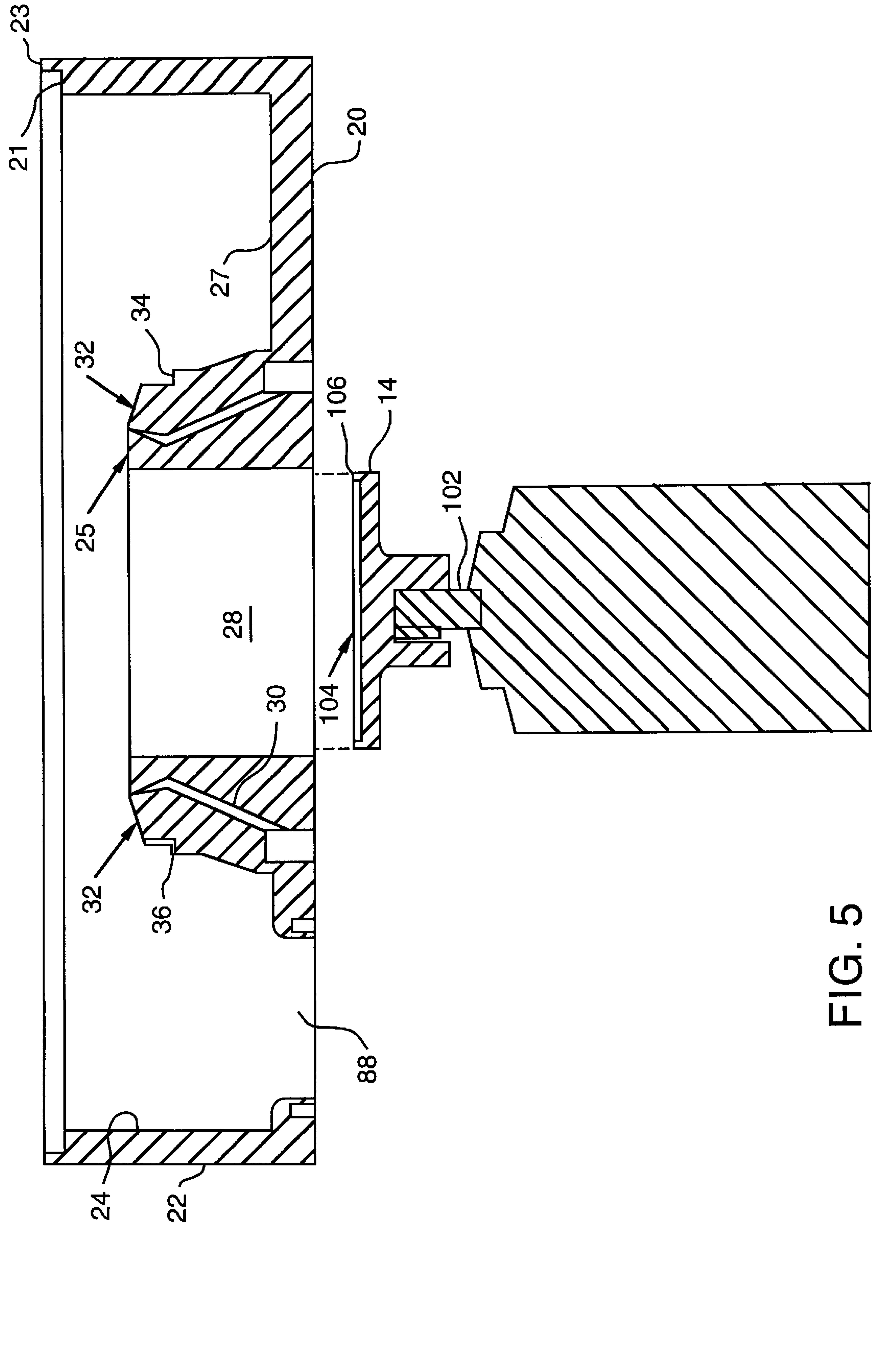

FIG. 5

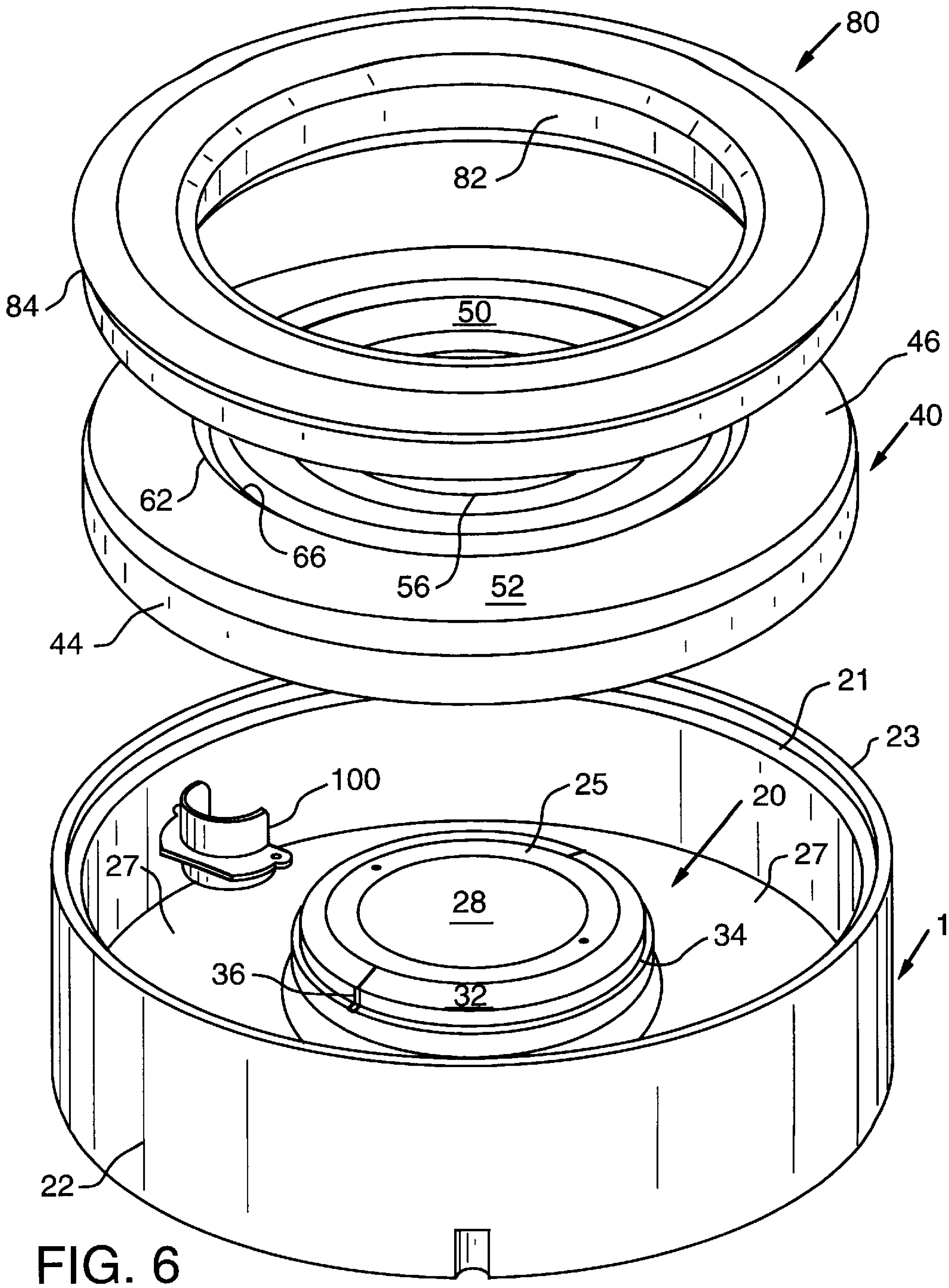

FIG. 6

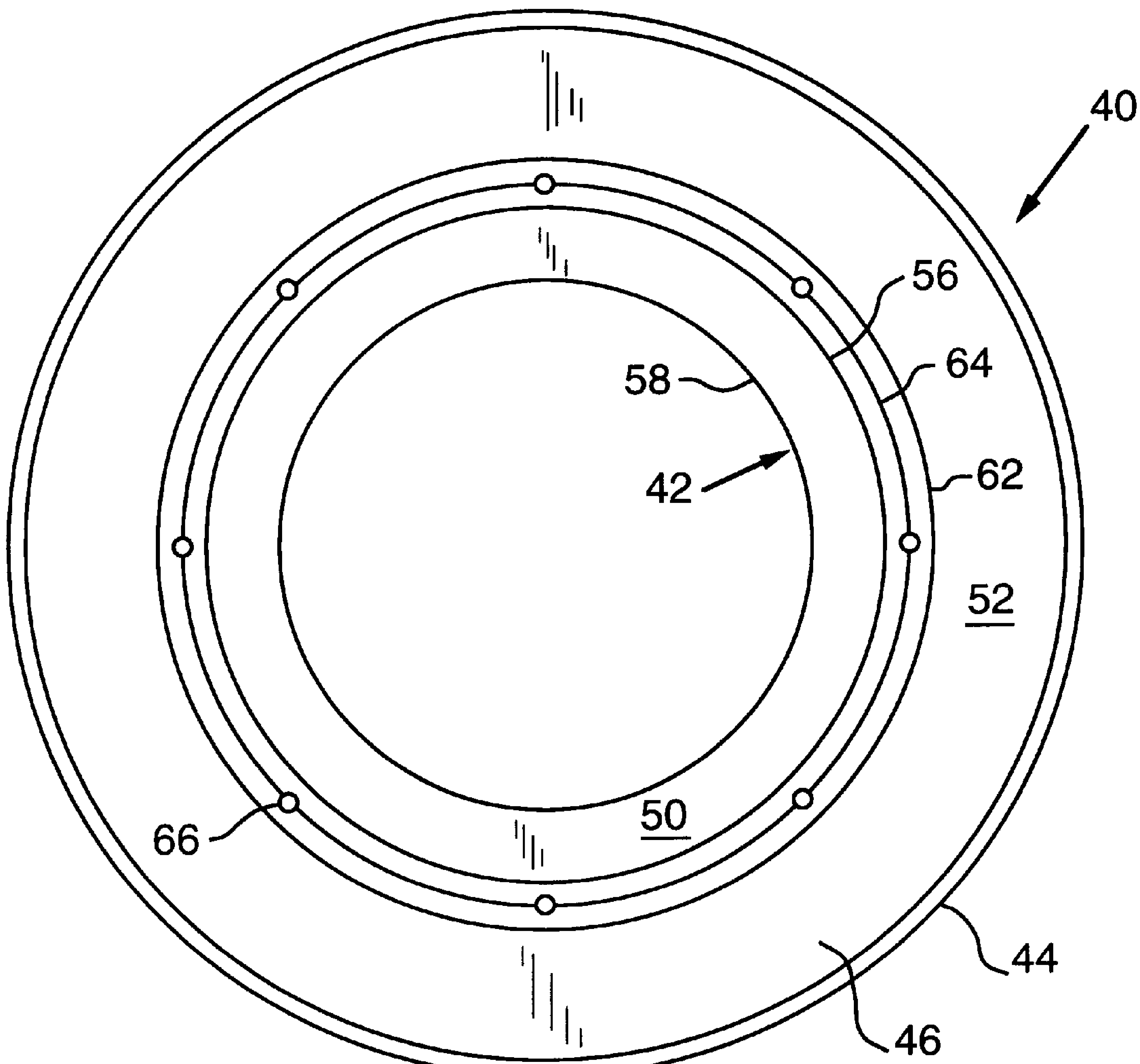

FIG. 7

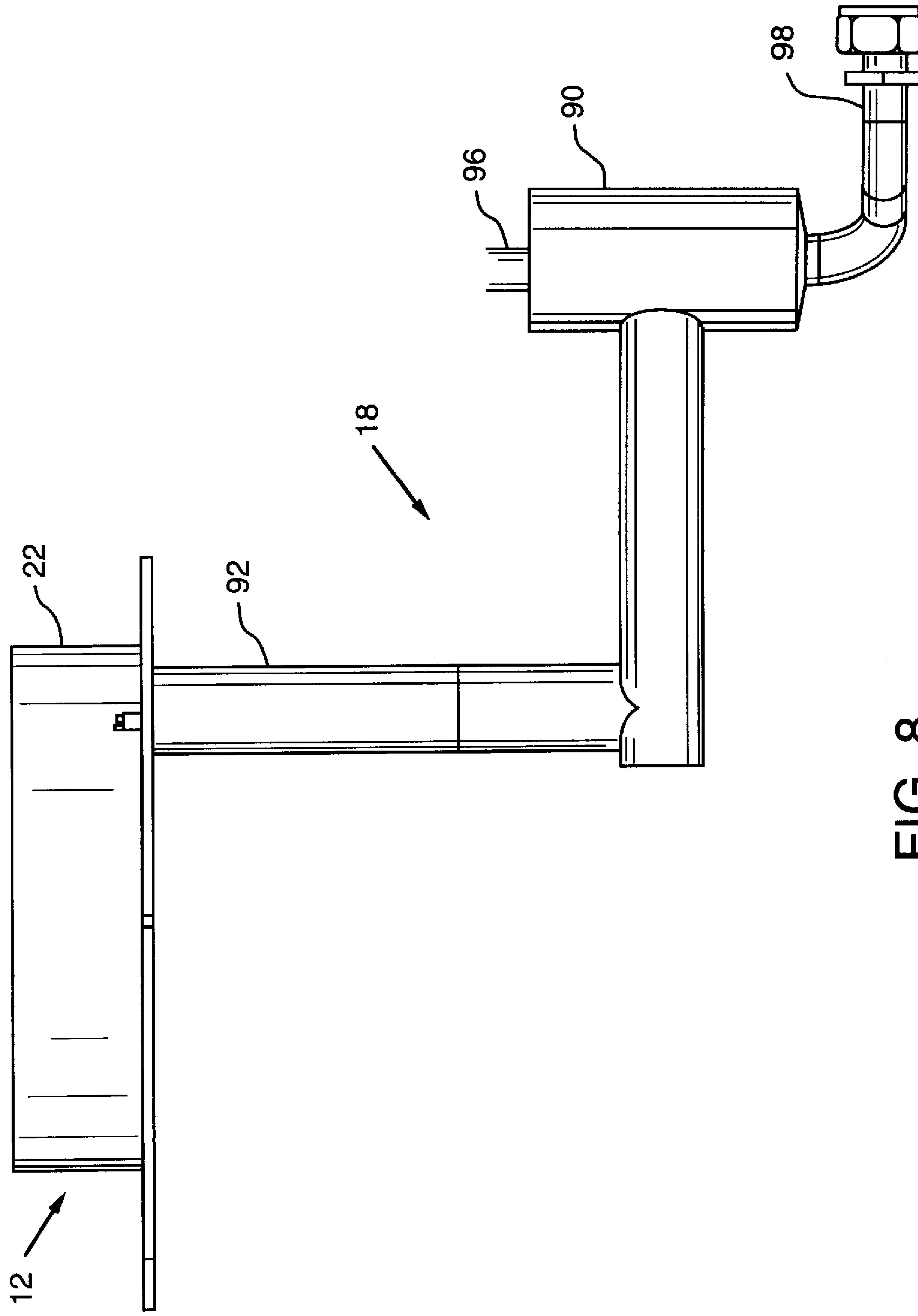

FIG. 8

SPIN COATING BOWL EXHAUST SYSTEM

This application is a continuation application of U.S. patent application Ser. No. 08/667,740, Filed Jun. 21, 1996 now U.S. Pat. No. 5,769,945.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to systems and methods for exhausting vapor and liquid. More particularly, the present invention relates to an exhaust system and method for a process bowl in a spin coating apparatus for the coating of wafer shaped semiconductor material.

2. Description of the Invention Background

Integrated circuits are typically constructed by depositing a series of individual layers of predetermined materials on a wafer shaped semiconductor substrate, or "wafer". The individual layers of the integrated circuit are in turn produced by a series of manufacturing steps. For example, in forming an individual circuit layer on a wafer containing a previously formed circuit layer, an oxide, such as silicon dioxide, is deposited over the previously formed circuit-layer to provide an insulating layer for the circuit. A pattern for the next circuit-layer is then formed on the wafer using a radiation alterable material, known as photoresist. Photoresist materials are generally composed of a mixture of organic resins, sensitizers and solvents. Sensitizers are compounds, such as diazonapthaquinones, that undergo a chemical change upon exposure to radiant energy, such as visible and ultraviolet light resulting in an irradiated material having differing solvation characteristics with respect to various solvents than the nonirradiated material. Resins are used to provide mechanical strength to the photoresist and the solvents serve to lower the viscosity of the photoresist so that it can be uniformly applied to the surface of the wafers. After a photoresist layer is applied to the wafer surface, the solvents are evaporated and the photoresist layer is hardened, usually by heat treating the wafer. The photoresist layer is then selectively irradiated by placing a radiation opaque mask containing a transparent portion defining the pattern for the next circuit layer over the photoresist layer and then exposing the photoresist layer to radiation. The photoresist layer is then exposed to a chemical, known as developer, in which either the irradiated or the nonirradiated photoresist is soluble and the photoresist is removed in the pattern defined by the mask, selectively exposing portions of the underlying insulating layer. The exposed portions of the insulating layer are then selectively removed using an etchant to expose corresponding sections of the underlying circuit layer. The photoresist must be resistant to the etchant, so as to limit the attack of the etchant to only the exposed portions of the insulating layer. Alternatively, the exposed underlying layer(s) may be implanted with ions which do not penetrate the photoresist layer thereby selectively penetrating only those portions of the underlying layer not covered by the photoresist. The remaining photoresist is then stripped using either a solvent, or a strong oxidizer in the form of a liquid or a gas in the plasma state. The next layer is then deposited and the process is repeated until fabrication of the semiconductor device is complete.

Photoresist and developer materials are typically applied to the wafer using a spin coating technique in which the photoresist is dispensed on the surface of the wafer as the wafer is spun on a rotating chuck. The spinning of the wafer distributes the photoresist over the surface of the material and exerts a shearing force that separates the excess photoresist from the wafer thereby providing a thin layer of photoresist on the surface of the wafer. Spin coating operations are performed in a clean room environment, and it is necessary to contain not only the excess coating material that is separated from the wafer, but also the vapor resulting from the evaporation of the solvent. In addition, photoresist materials are generally very expensive, ranging from $500 to $2300/gallon, therefore, reducing the amount of coating material used in the process can significantly reduce the overall cost of producing semiconductor devices. Also, a build up of excess coating material in the bowl requires additional downtime to remove and clean the bowl that further increases production costs.

FIG. **1** shows a side view of a typical bowl **200** and a porous wafer support chuck **202** of the prior art, such as is disclosed in U.S. Pat. No. 5,289,222 issued Feb. 22, 1994 to Hurtig. The wafer support chuck **202** is supported by a shaft **204** that passes through a hole **206** in the bowl **200** and attaches to a spin motor **208** in a motor compartment **209**. A wafer **210** having a top and a bottom surface, **212** and **214** respectively, is placed on the wafer support chuck **202** and is secured using a vacuum (not shown). The wafer **210** is spun and coating material, such as photoresist or developer, is dispensed onto the top surface **212** of the wafer **210**. The rotation of the wafer **210** causes the coating material to distribute over the top surface **212** and exerts a shear force on the coating material that separates excess coating material from the surface **212**.

Some of the solvent in the excess coating material vaporizes upon leaving the surface producing dry aerosol particles of the coating mixed with the liquid drops which accumulate over time on wall **216** of the bowl **200**. Also, the excess coating material has a tendency to creep around the edge of the wafer **210** and contaminate the bottom surface **214**. If the coating material on the bottom surface **214** migrates to the chuck **202** a loss of vacuum could occur and the wafer **210** will be released, possibly damaging the wafer. A solvent spray nozzle **218** is attached to the bowl **200** and is directed toward the edge of the wafer **210** to rinse the bottom surface **214**, thereby preventing a buildup of coating material. Solvent spray holes (not shown) are also provided in the bottom **217** of the bowl **200** to rinse the coating solution from the bottom surface.

The excess liquid coating and liquid solvent are drained from the bowl **200** using drain line **220** and the solvent vapors are purged from the bowl **200** with air through air purge line **222**. Solvent vapors are exhausted from the motor compartment **209** through a safety exhaust line **224**. The drain line **220**, the air purge line **222** and the safety exhaust line **224** are connected to an exhaust manifold and the vapor and liquid are separated and either reclaimed or disposed accordingly.

One problem that exists with the prior art design shown in FIG. **1** is that in the region between the bottom surface **214** of the wafer **210** and the bottom of the bowl **217** a low pressure zone is created that results in a recirculation zone being formed that increases the amount of contamination that reaches the bottom surface **214** of the wafer **210**, the bottom of the bowl **217**, the chuck **202**, and the motor **208**. The recirculation zone results in a lower production yield due to contamination of the wafers and an increase in the overall processing time due to the increased downtime required to clean the bowl **200**.

One prior art effort to eliminate the recirculation zone, shown in FIG. **2**, employs a bowl **200** having a bottom **217** that is in close proximity to the bottom surface **214**. While this design does eliminate the recirculation zone beneath the bottom surface **214**, the pressure differential between the edge of the wafer and the axis of rotation and the proximity of the bottom **217** to the bottom surface **214** produces a wicking effect that draws coating material in toward the center of the bowl **200**. The proximity of the bottom surface **214** to the bottom **217** of the bowl **200** also makes it more difficult to rinse the coating material off the bottom surface **214** using the solvent spray nozzle **218**.

Another problem is that prior art bowls are generally segregated, such as by divider **226**, to prevent the excess coating material from getting splashed or drawn onto the bottom surface **214** of the wafer **210**. While this design is effective for that purpose, the solvent is also segregated from the excess coating material that is removed from the wafer **210** and the dry aerosol particulates that are produced as the solvent in the coating evaporates, all of which makes it more difficult to remove the liquid and solid coating material from the bowl **200**. The problems of the liquid coating drying and forming a build up occurs not only in the bowl, but in the drain lines leading to the exhaust manifold, which, of course, leads to increased downtime to clean the bowl and the drain lines. The amount of downtime required to clean the bowl in the prior art is further increased by the fact that in order to fully clean the bowl or the chuck and motor or to perform maintenance, the bowl and chuck have to be disassembled to separate the components. Thus, it is apparent that a need exists for an improved spin coating bowl design which overcomes, among others, the above-discussed problems so as to provide a spin coating bowl that requires less maintenance and the maintenance that is performed requires less overall downtime.

SUMMARY OF THE INVENTION

The above objects and others are accomplished by a drain system and method in accordance with the present invention. The system is used in the process of spin coating a top surface of a wafer with a coating material, the wafer having an edge and a bottom surface that is supported and rotated by a rotatable chuck attached by a shaft to a spin motor. The drain system includes a bowl having an exhausted drain configured to receive excess liquid and vapor from the spin coating and an assembly configured to maintain the drain at a negative pressure differential relative to the bowl. In a preferred embodiment, a baffle is attached to the bottom to limit the flow of the liquid and vapor into the drain to a predetermined direction.

Accordingly, the present invention provides an effective solution to problems associated with the improper drainage of the process bowl so as to provide a cleaner process bowl, thereby reducing the extent of downtime required to clean the bowl. These and other details, objects, and advantages of the invention will become apparent as the following detailed description of the present preferred embodiment thereof proceeds.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiment of the present invention will be described in greater detail with reference to the accompanying drawings, wherein like members bear like reference numerals and wherein:

FIG. **1** is a side cross sectional view of a prior art spin coating apparatus;

FIG. **2** is a side cross sectional view of another prior art spin coating apparatus;

FIG. **3** is a side cross sectional view of a preferred embodiment of the present invention with a wafer supported by a chuck in a process position;

FIG. **4** is a perspective cross sectional view of the bowl with the wafer chuck disposed in the wafer loading position;

FIG. **5** is a side cross sectional view of the bowl with the wafer chuck disposed in the maintenance position;

FIG. **6** is an exploded perspective view of the bowl with the air ring, top ring and baffle;

FIG. **7** is a top plan view of the air ring; and,

FIG. **8** is a side view of the exhausted drain attached to the bowl.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The operation of the apparatus **10** will be described generally with reference to the drawings for the purpose of illustrating present preferred embodiments of the invention only and not for purposes of limiting the same. The apparatus **10** of the present invention includes a process bowl **12** through which a rotatable chuck **14** is disposed to support a wafer **16** having a diameter D, a top surface **13**, a bottom surface **15** and an edge **17** during a spin coating of a coating material onto the wafer **16**. The bowl **12** is attached to an exhausted drain system **18** to allow for the removal of excess liquid and vapor coating material spun off the wafer **16** during the spin coating operation, as well as solvent materials. While preferred embodiments of the invention will be discussed with respect to spinning a coating material onto a circular surface of a wafer, one skilled in the art will appreciate that the invention can be suitably modified to dispense liquids onto any number of surfaces.

In a preferred embodiment, the process bowl **12** is circularly shaped having a central axis A—A, and a bottom **20** and a side **22** defining an interior region **24**. The side **22** has an upper edge **21** with a vertical lip **23** extending therefrom. The bottom **20** includes a generally cylindrically shaped raised portion **26** surrounding central axis A—A having an upper surface **25** containing a central opening **28** surrounded by an annular lower portion **27**. The upper surface **25** of the raised portion **26** has a peripheral surface **32** that is sloped toward the lower portion **27** leading to a circumferential step **34**. Solvent dispense nozzles **30** are internally formed in the raised portion **26** circumferentially around the central axis A—A and are attached to a solvent source (not shown) and directed at the bottom surface **15** of the wafer **16**. The dispense nozzles **30** are distributed circumferentially and are directed radially away from the axis A—A through peripheral surface **32**. The circumferential step **34** contains notched leakage paths **36** corresponding to the location of the dispense nozzles **30** to allow solvent provided through the solvent dispense nozzles **30** to drain to the lower annular portion **27**. The interior region **24** is unsegregated or unpartitioned to facilitate the flow of excess liquid and vapor to the drain system **18**. Alternatively, the interior region **24** could be partitioned to form segregated plenum and mutual fluid communication between the partitioned plenum and the drain system **18** could be provided.

A circular air ring **40** is provided having an inner rim **42**, an outer rim **44** and top and bottom surfaces, **46** and **48**, respectively. The top and bottom surfaces, **46** and **48**, respectively, are crowned wherein the crown forms a circle having a diameter less than that of the wafer **16** and defining an inner sloped surface **50** and an outer sloped surface **52**. The inner rim **42** is seated on the circumferential step **34** and the inner sloped surface **50** and the sloped peripheral surface **32** define a first circumferential groove **54** having two edges, **55** and **56**, respectively and a base **58**. The solvent is dispensed using the dispense nozzle **30** and the solvent and the excess coating material are directed toward the bottom surface **15** of the wafer **16** above the groove **54** drained through the notched leakage paths **36**. Preferably a second circumferential groove **60** is formed at the crown of the top surface **46** in close proximity to the edge **17** of the wafer **16**, when the wafer **16** is supported by the chuck **14**. The groove **60** is defined by edges, **56** and **62**, respectively, and base **64** contains perforations **66** extending from the top surface **46** through the bottom surface **48**. The bottom surface **48** and the bottom **20** of the bowl **12** define a lower plenum **70** that extends annularly around the raised portion **26**. The top surface **46** and the side **22** of the bowl **12** define an upper plenum **72** that extends annularly between the outer rim **44** of the air ring **40** and the side **22**. When the inner rim **42** is seated on the circumferential step **34**, the outer rim **44** is preferably not in contact with the bowl **12**, thereby providing fluid communication between the upper and lower plenums, **70** and **72**, respectively.

Preferably, a top ring **80** is provided having an inner lip **82** that extends into the interior region **24** having a diameter greater than the diameter of the wafer **16** and an outer diameter containing two circumferential steps **84** that mate with side edge **21** and lip **23**. The top ring **80** has a bottom face **86** that extends toward the bottom **20** of the bowl **12** and opposes the top surface **46** and preferably slopes from the inner lip **82** to the outer diameter, such that bottom face **86** is above the wafer **16** near the inner lip **82** and below the wafer **16** near the side **22**, when the wafer **16** is being supported in a process position, as shown in FIG. **3**, and the bottom face **86** and the top surface **46** form a plenum region that is part of the upper plenum **72**. The bowl **12**, air ring **40** and top ring **80** are preferably constructed from a material that is resistant to, but wetted, by the spin coating chemicals and can be easily cleaned, such as Teflon®, although other material can be incorporated to suit the particular needs of the practitioner.

In a preferred embodiment, the exhausted drain system **18** includes a single drain **88** in the bottom **20** of the bowl **12**, which is in close proximity to the outer rim **44** and in fluid communication with the lower and upper plenums **70** and **72**, respectively, thereby providing unsegregated or unpartitioned access to the drain system **18**. The unsegregated access to the drain **88** reduces the amount of material that precipitates or drys in the bowl **12** resulting in fewer maintenance shutdowns to clean the bowl. The use of a single drain provides for higher flow rates near the drain which maintain particles in suspension and leads to increased mixing of the solvent and the excess coating material allowing the coating material to be carried out of the system. Also, the use of a single drain and an unsegregated bowl maintains the solvent vapors in contact with coating material preventing additional evaporation of the solvent and drying of the coating material in the bowl **12** and in the drain lines. The exhausted drain **88** is connected to an exhaust manifold **90** through piping **92**. The liquid and the vapor are gravitationally separated in the exhaust manifold **90** with the vapor exiting through exhaust pipe **96** and the liquid exiting through drain **98**. A negative pressure is applied to the exhausted drain system **18** through exhaust pipe **96**, which draws vapor and liquid from the interior region **24** of the bowl **12**. A semicircular cylindrical baffle **100** is attached to the bottom **20** around the drain **88** to more uniformly distribute the flow in the interior region **24**. The presence of the exhausted drain **88** on one side of the bowl **12** would tend to preferentially exhaust vapor from the portion of the bowl **12** nearest to the drain **88**. The baffle **100** forces the vapor and liquid to flow into the drain **88** in a predetermined direction resulting in a more uniform flow field in the interior region **14** that further enhances the mixing of the solvent and the coating material providing for a cleaner bowl **12**. In an alternative embodiment, the bottom **20** can be sloped to further aid the flow of the solvent and coating material to the drain **88**.

The drainage performance of the single drain **88** is enhanced through the use of the chuck **14** that is dimensionally smaller than the opening **28** in the bowl **12**. The chuck **14** is disk shaped and attached by a shaft **102** to a spin motor (not shown) for rotation of the shaft **102** and the chuck **14** and to servomotor (not shown), or other lift means, which is used to reciprocate the chuck **14** through the opening **28** between a maintenance position (FIG. **5**), a process position (FIG. **3**) and a wafer receiving position (FIG. **4**). Because the chuck **14** is dimensionally smaller than the opening **28**, the processing position can be lowered with respect to the raised portion **26** and the air ring **40**, which allows the practitioner of the present invention to control the resistance of the flow path from between the wafer **16** and the raised portion **26** and the chuck **14** and the opening **28**. An important aspect of controlling the resistance is that the flow of solvent vapors through the opening **28** can be minimized, because the path of least resistance will be through or around the air ring **40** to the exhausted drain **88**. Also, because the chuck **14** can be reciprocated through the opening **28**, the spin motor and the servomotor can be separated from the bowl **12**, so that small amounts of solvent vapor that may travel through the opening **28** can be processed with the system air all of which combine to eliminate the need to have a dedicated vapor exhaust. In addition, the chuck **14** can be reciprocated to its maintenance position and the bowl **12** or the chuck **14** and lift means can be maintained separately without the need to disassemble either component, which greatly reduce maintenance time. For example, if a process bowl **12** is to be cleaned, the chuck **14** can be lowered to the maintenance position and the process bowl **12** can be switched out and replaced with another bowl so that the spin coating apparatus can be operating while the cleaning is being performed which significantly reduces the downtime of the processor. The chuck **14** is preferably a hard plastic, such as Teflon or polyphenylene sulfide (PPS), or a metal oxide through which a vacuum can be drawn using port **108** to secure the wafer **16** on the chuck **14** and which also has a low thermal conductivity to minimize the amount of heat generated by the spin motor that is transferred to the wafer **16**. In a preferred embodiment, the top surface **104** has a circumferential raised rim **106** that allows the wafer **16** to be supported in sufficiently close proximity to the top surface **104** to allow the vacuum to hold the wafer **16**, but the gap between the wafer **16** and the top surface **104** further reduces the heat transfer to the wafer **16**.

In the operation and method of the present invention, the air ring **40** is inserted into the bowl **12** with the inner rim **42** seated on the circumferential steps **84** and the top ring **80** is positioned so that the circumferential steps **84** mates with side edge **21** and lip **23** on the side **22** of the bowl **12**. The chuck **14** is initially in the maintenance position and then is moved through the process position to the wafer receiving, or loading, position using the servomotor. A wafer **16** is placed on the chuck **14** and a vacuum is drawn on the chuck **14** to secure the wafer **16** and the chuck **14** is lowered to the process position. The spin motor is activated to rotate the chuck **14** and wafer **16** and a negative pressure is applied through the exhaust **96** as the coating material is then dispensed onto the wafer **16** using a dispense assembly connected to a coating source. The rotation of the wafer **16** causes the coating material to distribute over the top surface **13** of the wafer **16** and the majority of the excess coating material will be spun off the wafer **16** into the upper plenum **72** and will contact the downwardly sloping surfaces of either the top surface **48** of the air ring **40**, the side **22**, or the bottom face **86**, which serve to direct the flow of material toward the lower plenum **70** and drain **88**. Some of the excess coating material will creep around the edge **17** of the wafer **16** onto the bottom surface **15**. The excess coating material will travel along the bottom surface **15** until it encounters circumferential edge **62** which allows coating material to move downwardly along the surface **52** or toward base **64**. If the material is not removed by edge **62**, the excess coating material traveling toward axis A—A will next encounter edge **56** which also allows the excess coating material to flow downwardly to base **64** or on surface **50**, both of which are in fluid communication with the lower plenum **70**. Excess coating material that passes edge **56** is sprayed by solvent nozzles **30**, which are directed away from axis A—A toward the bottom surface **15**. The solvent and excess coating material run down the downwardly sloping surfaces **50** and **32** and are drained through notched leakage paths **36** into the lower plenum **70**. The proximity of the bottom surface **13** of the wafer **16** to the raised portion **26** of the bowl **12** as a result of the chuck **14** having smaller dimension than the opening **28** serves to minimize the flow of solvent back through the opening **28**. The use of a single drain provides for an unsegregated exhaust system that allows the solvent to mix freely with the excess coating material, thereby minimizing the amount of dry coating material that remains in the bowl **12** and the drain lines when the solvent evaporates. After the coating operation is complete, the rotation of the wafer **16** and chuck **14** is stopped and the chuck is raised using the servomotor to the wafer receiving position and the wafer is removed and another wafer is placed onto the chuck **14** or the chuck **14** is lowered to the maintenance position, at which time the bowl **12** can be removed for cleaning or maintenance can be performed on the chuck **14**, spin motor and/or servomotor.

Those of ordinary skill in the art will appreciate that the present invention provides several advantages over the prior art. In particular, the subject invention eliminates the recirculation zone beneath the wafer and prevents capillary forces from being produced between the air ring that can result in damage to the wafer by the inclusion of vented depressions in the surface of the air ring. The subject invention also improves the drainage of the process bowl so as to provide a cleaner process bowl, thereby reducing the extent of downtime required to clean the bowl. Also, the subject invention has the advantage of allowing the wafer chuck and motor assembly to be separated from the process bowl without disassembly of either component and provides added versatility in the positioning of the wafer within the process bowl, which was not present in the prior art. While the subject invention provides these and other advantages over the prior art, it will be understood, however, that various changes in the details, materials and arrangements of parts and steps which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

What is claimed is:

1. An apparatus for spin dispensing a liquid onto a wafer said apparatus comprising:

a rotatable chuck;

a shaft attached to said chuck;

a spin motor attached to said shaft;

a liquid dispense assembly positioned relative to the wafer;

a bowl having a bottom and a side defining an interior region, said bottom containing an opening in which said shaft is movably disposed therethrough and said rotatable chuck is disposed within said interior region;

a drain opening through said bottom of said bowl; and

an upstanding baffle attached to said bottom of said bowl, and extending around a portion of said drain opening to limit access into said drain from a predetermined annular direction, said upstanding baffle having a surface curved about an axis perpendicular to said bottom of said bowl to limit flow only in the direction of rotation of said rotatable chuck and an air ring attached to said bowl for directing a liquid dispensed within said bowl in a desired direction within said interior region.

2. The system of claim **1** further comprising an exhaust manifold attached to said drain.

3. The system of claim **2** further comprising:

an exhaust line attached to said exhaust manifold so as to remove the vapor from said exhaust manifold; and,

a drain line attached to said exhaust manifold so as to remove the liquid from said exhaust manifold.

4. An apparatus for dispensing a liquid onto a wafer, said apparatus comprising:

a rotatable chuck for supporting the wafer thereon;

a shaft attached to the chuck;

a spin motor attached to said shaft;

a dispense assembly positioned to dispense liquid onto the wafer;

a bowl having a bottom and a side defining an interior region, said bottom containing a first opening in which said shaft is movably disposed therethrough and said rotatable chuck is disposed within said interior region;

an air ring supported within said bowl between said bowl bottom and the wafer for directing the liquid to said bowl;

a drain opening through said bottom of said bowl; and

a baffle connected to said drain, said baffle having a front upstanding surface and a back upstanding surface, wherein said baffle comprises a semicircular cylindrical member attached to the bottom of said bowl, said semicircular cylindrical member having an upstanding curved surface extending around an axis perpendicular to said bottom of said bowl.

5. An apparatus for dispensing a liquid onto a wafer, said apparatus comprising:

a rotatable chuck for supporting the wafer thereon;

a shaft attached to the chuck;

a spin motor attached to said shaft;

a dispense assembly positioned to dispense liquid onto the wafer;

a bowl having a bottom and a side defining an interior region, said bottom containing a first opening in which said shaft is movably disposed therethrough and said rotatable chuck is disposed within said interior region;

an air ring supported within said bowl between said bowl bottom and the wafer for directing the liquid to said bowl;

a drain opening through said bottom of said bowl; and

a baffle connected to said drain, said baffle having a front upstanding surface and a back upstanding surface, wherein said baffle is attached to said bottom of said bowl and is oriented relative to said drain to limit flow of fluid into said drain only in the direction of rotation of the chuck.

6. An apparatus for dispensing a liquid onto a wafer, said apparatus comprising:

a rotatable chuck for supporting the wafer thereon;

a shaft attached to the chuck;

a spin motor attached to said shaft;

a dispense assembly positioned to dispense liquid onto the wafer;

a bowl having a bottom and a side defining an interior region, said bottom having at least a sloping portion and containing a first opening in which said shaft is movably disposed therethrough and said rotatable chuck is disposed within said interior region;

a drain opening through said bottom;

a flow-directing air ring supported within said bowl between said bowl bottom and the wafer; and

an upstanding semi-circular baffle attached to said bottom of said bowl and extending around a portion of said drain opening to limit access into said drain opening from a predetermined annular direction.

7. An apparatus for dispensing a liquid onto a wafer, said apparatus comprising:

a rotatable chuck for supporting the wafer thereon;

a shaft attached to the chuck;

a spin motor attached to said shaft;

a liquid dispense assembly positioned relative to the wafer;

a bowl having a bottom and a side defining an interior region, said bottom containing a first opening in which said shaft is movably disposed therethrough and said rotatable chuck is disposed within said interior region;

an air ring supported within said bowl between said bowl bottom and the wafer;

a top ring affixed to an upper portion of said bowl side in spaced-apart relationship from said air ring;

a drain opening through said bottom of said bowl; and

a baffle supported between said bottom of said bowl and said air ring, said baffle positioned to limit access to said drain from a predetermined annular direction.

8. An apparatus for dispensing a liquid onto a wafer, said apparatus comprising:

a rotatable chuck for supporting the wafer thereon;

a shaft attached to the chuck;

a spin motor attached to said shaft;

a dispense assembly positioned to dispense liquid onto the wafer;

a bowl having a bottom and a side defining an interior region, said bottom containing a first opening in which said shaft is movably disposed therethrough and said rotatable chuck is disposed within said interior region;

first and second rings supported in said interior region of said bowl;

a drain opening through said bottom of said bowl; and

a baffle affixed to said bottom of said bowl to limit access to said drain from a predetermined annular direction.

9. A bowl for use in a spin coating apparatus, said bowl comprising:

a bottom and a side defining an interior region, said bottom defining an opening;

a drain in said bottom;

a baffle connected to said bottom and having a surface curved about an axis perpendicular to said bottom, said baffle positioned to limit access to said drain from a predetermined annular direction; and

an air ring attached to said bowl for directing a liquid dispensed within said bowl in a desired direction within said interior region.

10. The bowl of claim **9** further comprising a top ring attached to said bowl for defining a passage within said interior region for direction the liquid in said desired direction.

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